To Assess Social- Emotional Learning of Students Enrolled in STEM Education

SHORT SYNOPSIS

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DOCTOR OF PHILOSOPHY

to

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by

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DECLARATION BY THE SCHOLAR

I, Anshu Singla, hereby declare that the short synopsis on **"To Assess Social-Emotional Learning of Students Enrolled in STEM Education"** being submitted for the partial fulfillment of the requirement for the degree of **Doctor of Philosophy** in department of Education, under Faculty Dr Babita Parashar Manav Rachna University, Faridabad during the academic year 2019-20.

It is a bonafide record of original proposal proposed under the supervision of Dr.Babita Parashar, Associate Professor, Department of Eduction, ManavRachna University, Faridabad, has not been submitted in full or part to any other university or institute for degree or diploma. Further, it is certified that short synopsis is within the plagiarism limit and copy of the same is attached as per University norms.

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ABSTRACT

India being a developing country needs human resources equipped with remarkable set of 21st century skills attitude to produce technological advancement using interdisciplinary thinking. For the growth of a country and realizing the need to create scientific temperament among young minds and to cultivate the spirit of curiosity and innovation, focus is on STEM EDUCATION means science, technology, engineering and math's education. To promote critical thinking and problem solving competences, Government of India is focusing to provide STEM education in schools by establishing Atal Tinkering Labs, where young minds can give shapes to their ideas through hands on activities. Young children will get chance to work with tools and equipment to understand what, how and why aspect.

However with advancement in technology, life has become too fast. There is too much aggression & unrest among young generation. The dearth of social and emotional strength may be the reason of such aggression and unrest among students. To be successful in school and life, one should have developed social emotional competencies. National Education Policy 2020 has suggested that introduction of Social Emotional learning (SEL) in schools would leads to improvement in cognitive & social resilience and constructive social engagement. Students' attitude and perception toward STEM learning shows positive changes using robotic education (Anwas, S. &, Alexander, N).

This research has been designed with the aim to assess social emotional learning of students enrolled in STEM Education. Atal Tinkering Labs in schools are providing opportunities to students for STEM education. One of the objectives of ATLs., as given in Hand Book of ATLs is improvement in SEL of students. Through this descriptive research, researcher will assess SEL of Students using tools like interviews, Focus group discussion, questionnaire etc. It is proved that Hand on Experience in Robotic lab

improve inquiry based learning, critical thinking and problem solving skills. It is expected that STEM Education would also improve social emotional qualities of students. Whosoever works in ATLs, his/her certain qualities like collaboration, team spirit, leadership etc. will definitely improve.

Key words: Atal Tinkering Lab, STEM Education, Innovation, Social-Emotional qualities,

CONTENTS

Sr. No.	Description	Page No.
1.	**Introduction**	6-12
	1.1 STEM Education	7-9
	1.2 Social Emotional Skills	9-10
	1.3 Learning	10-11
	1.4 How Stem Education Can Help in Improving Social and Emotional Learning	11-12
2.	**Review of Related Literature**	12-17
3.	**Significance of the Study**	18
4.	**Statement of the Problem**	18
5.	**Operational Definitions**	19
	5.1 Stem Education	19
	5.2 Social Emotional Learning	19
6.1	**Objectives of the Study**	19-20
6.2	**Hypothesis**	20
7	**Methodlogy**	20-24
	7.1 Research Method	21
	7.2 Sampling	21-22
	7.3 Variables of the Study	22
	7.4 Tools to be used	23
	7.5 Procedure of Data Colletion	23
	7.6 Statistical Technique	23-24
8	**References**	24-25

1. INTRODUCTION

Education is the most influential weapon to bring about change in the world. It removes gender disparity, reduces poverty, creates a livable planet, stops unnecessary death and illness, a symbol of hope and confidence in the future of mankind (Nelson Mandela, 2000). Education must be considered in the context of its immense potential for bringing about transformation and social changes in the quality of human life. Its impact on bringing about paradigm change in the flow of social order can never be ignored (Rath 2012).

Indian Education is known worldwide for its ancient history in field of science and mathematics. Concept of Zero and decimal system was given to world by Indians. Theory of Atom and extraction of metals like Zinc, copper is also important contribution of India to World of science. However in the competitive world of 21st century, with latest innovation in technology, life has become too fast. There is constant stress on everyone to cope up with changing circumstances. For better adjustment in society our future generation should be well equipped with technology and also should be socially and emotionally strong enough to take everyday challenges. In present Scenario Indian students are known for their intelligence and are working throughout the world. However the transition from being a user of technology to an innovator will take place, if our students are provided with opportunities where they can freely work on technology.

The prosperity of a nation is defined by the quality level of its educators, researchers, innovators and the vision of its academic leader (TOWARDS MORE EFFECTIVE EDUCATION: Emergence of STEM education in India, by Vivekanand International Foundation page 37), For the vast Indian population, it is necessary to develop people's skills so that they can be employed in specialized STEM sector. There is a direct correlation between developmental index and involvement in STEM education. With the realization of the need of STEM education, Government of India has been establishing Atal Tinkering Labs in High & senior secondary schools in India to promote a culture of innovation and entrepreneurship across the country.

Tinkering means to make small change to something, especially to repair or improve it. Atal Tinkering Labs are 1200 to 1500 square feet area dedicated to endorse STEM education by providing innovative workshop where do it yourself kit on latest technologies like 3DPrinter, Robotics, internet of Things , miniaturized electronics are installed and students from class 6 to 12 can work to learn and experiment. Establishing ATLs in schools is a step towards promoting STEM education ie Science, Technology, Engineering & Maths. Its main objectives are;To encourage Risk taking.To teach the value of team work & collaboration.To apply knowledge.To improve problem solving skills.Encourage adoption of new technological innovations.

1.1 How STEM Education Helpful

What is the purpose of Education? To attain personal and professional success in life, one needs education. In the twenty first century nations are in competition with each other to take lead for the achievement of sustainable growth and development, be it social or economic. As our honorable Prime Minister Sh. Narender Modi emphasized on To become ATAMNIRBHAR ie Be Self-Sufficient and Self-Sustainable. The Role of educational institutes, especially schools has become more challenging. It is expected that younger generation should be well versed with latest technology as well as socially emotionally strong. However schools mainly focus on achieving academic success, which is based on securing good marks in Board exams. Our examination system assesses only cognitive part of learning so developing skills in child is not focused in schools. Researches on Neuroscience of learning and educational psychology reveals that when a child learns a particular skill, changes appear in his brain, but if the child stop using that skill; those changes in brain are reverted. Therefore, principle of 'use it or lose it' is important for life-long learning. Royal Society expressed in 'Neuroscience: implications for education and lifelong learning' that for creating more learning opportunities inside & outside classroom, and throughout life, adaptive digital technologies are likely to use.

STEM education will also be helpful in achieving Sustainable Development Goal 4.7 of UNESCO. In this regard, Mahatma Gandhi Institute of Education for Peace (MGIEP) focuses on education for building peaceful and sustainable societies across the world. Its vision is 'Transforming Education for Humanity, Building Emotional Learning for Education 2030. The Mission is Building Social Emotional Skills for Learners through formal education. Based on research from neuroscience of learning, the Institute envision a 'A whole brain approach to education' by focusing on building intellectual and emotional intelligence in learners, to equip them to build more peaceful and sustainable societies (Rethinking Schooling, annual Report of UNESCO MGIEP)

STEM Education provides opportunity to face challenges in the form of problems given. Students work on it in groups, they learn cooperation, collaboration and team spirit. Moreover they learn how to handle failure in life, as many times they will not be able to solve the problem in single attempt. Self-learning would make them more responsible and their decision taking skills would also improve. Thus social, emotional qualities of students enrolled for STEM Education will be enhanced. Combining the traditional teaching methodologies with today's experimental learning will be the key towards creating a unique blended education in India.

In today world there is competition among countries with each other to take lead for achievement of sustainable growth and development. Therefore survival of states in emerging competitive economies depends on the quality and professionalism of its human resource which they produce through system of higher professional education with use of technology. Hence it is important to prepare the youth for the competitive world. The prerequisite for the growth of society is to first make the youth relevant to society and the nation as both are changing very fast. Skilled and competent manpower is the basic demand of the progressive society in the global world (SNEHI 2009). Professional education is considered to be backbone of country's growth and development. Professionalism is the conduct/efficiency or skillfulness expected out of a person. Focus of professionalism is not on the fact that what a person does but on how a person does in a better way.

Brock, Avril (2009) has suggested seven dimension of professionalism namely –knowledge, education, skill, autonomy, ethics and rewards. All these dimensions are interconnected, if a well knowledgeable skilled educated person is not ethically strong or not able to tackle social, emotional problems, desired results are not achieved from such person.

STEM Education develops Professionalism among new generation. Professionally well skilled student with social emotional learning is an asset to a nation. Goal of STEM education is to provide greater opportunities for success and prosperity of people

1.2 Social Emotional Skills

Collaborative for Academic, social and emotional learning (CASEL) defined social and emotional skills as activities which helps children and adult in acquiring and effective application of knowledge, attitude and skill needed to handle emotions, to make responsible decision, to establish and maintain decision, to establish and attain positive goals and to realize and express empathy.

Earlier Social-emotional learning (SEL) was considered a secondary skill but now it is reflected as an important tool to be successful in life. SEL consist extensive social and psychological skills which enable students to face challenges, handle emotions and communicate in better way. All these skills are the direct path to success in life.

CASEL offered the primary skills to be taught

- **Self-awareness**

  CASEL defined it as the capability to understand own feelings and thoughts and how they lead to particular behavior.

- **Self-Management**

  CASEL defined it as the capacity to manage feelings, thoughts and behavior in various situations which a person encounter during his life.

- **Social Awareness**

  CASEL defined it as a person ability to consider a situation from the perspective other individuals, groups or communities and empathize with them including people from other culture and backgrounds.

- **Relationship Skills**

  CASEL defined it as a person ability to develop healthy meaningful relationship with a various people from different background.

- **Responsible Decision Making**

  CASEL defined it as a person ability to make constructive choices about behavior and social interactions. These choices are based on social, moral, ethical and safe concern.

- **Team Building and collaborative**

  To work in a team a person require social skills like developing interpersonal relationship, communication skill and problem solving approach.

1.3 Learning

Learning is the most important aspect in teaching process. Learning can be said as a modification of behavior through experience which happens in our day to day life. This modification of behavior through learning and experience helps the person to adjust to his surrounding in better way. In 1973, Crow & Crow defined Learning as the process of acquiring habits, knowledge and attitude. According to Aggarwal (2002), learning is doing things in different ways and functions to overcome hurdles or to readjust to new situations. It is continuous change in behavior. It also empowers them to achieve goals.

In the views of Woodworth (1945), Human being is an inborn learner by nature. They are by nature curious, self-motivated, and keen to learn new things and make efforts to adjust. Mangal in 2014 explained that any activity can be called learning so far as it develop individual either in good way or bad way, and bring behavioural change.

With the aim to know the role of STEM Education in improving the social and emotional qualities of students this proposal research has been framed. To be successful in life, social and emotional learning is must. A person with social and emotional qualities is well adjusted to his /her environment. He is able to adapt to changes and therefore successful in life. Important social and emotional qualities to be nurtured among students are self-awareness self-management, social awareness, relationship skills, responsible decision making etc.

1.4 HOW STEM EDUCATION CAN HELP IN IMPROVING SOCIAL AND EMOTIONAL LEARNING

Social and Emotional skills can be understood as the belief and attitude that allow students to manage themselves as well as their relation with others. Schools are the place where academic needs are taken care, but it should also be the responsibility of schools to develop social emotional skills of students. Social emotional skills not only help in adjustment in society but also helpful in academic success. The schools which prepare students not only to qualify the academic test but also qualify the exams of life are called effective schools. Social emotional competencies and academic achievement should be integrated. If social emotional skills are absent among students, Schools have to face many challenges like indiscipline, unrest, growing incidences of bullying, violent and abusive behavior among students.

It is general observation that if our students are engaged in activities they are focused, well behaved and socially emotionally stable. For involvements of students, co-curricular activities and sports activities are organized in schools. Special Programs like Mindfulness activities, Peace Education etc has been started with help of NGOs, The Teacher Foundation in some schools to improve social emotional learning.

Students are involved physically and mentally while working with technology in Robotic labs, they work in team in collaborative way. They find it interesting to solve the problem. Many times they face failure while developing some program, working in team they learn to cope up with stress. This help in developing social emotional competences among students.

With the aim to know the role of STEM Education in improving social emotional qualities of students, this research has been designed. A well-managed, supportive and caring environment is suitable for more effective teaching of these competencies. In 2005, Bear has said that for development of autonomy, self-discipline and ethics among students, mutual understanding, cooperation and decision making skills are required. Such situations are provided through STEM Education in Atal Tinkering Labs where students perform various activities. It provides students with easily assessable opportunities to solve the problems in innovative way. This helps in developing good relations with fellow students and adults. As a consequence students are not afraid of making mistakes.

2. REVIEW OF RELATED LITERATURE

Review of literature is a process following which a researcher is able to update his knowledge about the literature related to his problem. With help of review of literature, researcher comes to know about the researches already done on the selected topic. It helps the researcher to select the meaningful problem for research, avoiding duplication of work and provides future guidelines to the researcher. Review of related literature provides the platform to researcher where researcher become aware with the recommendations which further guide the researcher in selecting, formulating, planning and executing the problem in required direction.

To develop an understanding on the topic selected for research, it is essential to know about the previous researches done and theories established in the field (HART 1998). The careful examination of study provides useful ideas, views, explanations or hypothesis in turn help the researcher to formulate a new problem (MEHAN R. 2010).

In the views of W. R. Borg, the review of related literature is the foundation of future work. The explained/tested hypotheses in the published literature provide helpful orientation for defining problem, planning, analyzing the results, giving recommendation. Good (1996) has said that one must read extensively, critically as a stimulus of thinking to produce original, creative and productive research.

- Osher, D. & Kidron, Y. reviewed around 100 years of researches related to school based social emotional learning and presented through their paper. According to them, social emotional skills are more relevant in the era of digital technology. Technology has affected all fields which include work, relationships and the challenges of inequality, growing population and climate change.
- Robert, T. & Jakson, C. (2018) found that informal learning environment increases students' interest in STEM learning and increase the chance for students for pursuing STEM as a career. Researchers have found that to pursue STEM learning, interests and motivation are important factors. Students are connected to the real-world issues through project based learning give a platform to students and get them chance to connect with. For example, students will take interest in math class, if calculation in mathematics can be used to explain the design and construction of planes. In calculations of Robot programming, students use mathematic formulas for measuring distance for their robotic challenges.
- William H. Roden & Rebecca A. Howsman in their research paper (2008) "Improving access to hand on STEM education using mobile laboratory" have analysed the impact of mobile laboratories on improving STEM education in schools. It states that schools often have limited resources to devote to science education, which can impact students interest in and preparedness for career in STEM. There are number of advantages of using mobile laboratories as a strategy for increasing the equity of access to high quality science education and stimulating interest in STEM career.
- Balaji, M., Balaji, V. & Chandersekran, M. (2015) in their research paper entitled 'Robotic training to bridge school students with Engineering', have revealed that robotics education make school students familiar with subjects of Engineering to choose as career before they get actually enrolled in Engineering courses. The robotic trainer FASTBOT is a good platform for school students to know various subjects of STEM Education like science, mathematics,

engineering & technology and application of their knowledge in real life situation. A training program of 25 hours in 3-5 days in robotics helps students in taking up engineering in the favorable way. When theses school students leave their school, they are more confident and enter in to

- Anwas, S. & Alexander, N. (2019) in their research paper have reviewed various research papers and their results on educational robots published from the year 2000 to 2018, both formal and informal learning environment. Researchers has adopted a systematic review approach and categorized 147 studies. The literature has been analyzed in the light of three goals:
    1. Determining implementation.
    2. Presenting experimental proof about benefit of using educational robots
    3. Defining research perspective in educational robotics to help in improving STEM pedagogies.
- Woolf, N. (2019) in the article "The case for integrating STEM and SEL education" has reviewed the role of STEM education for improving social emotional learning. According to this research cognitive, motor, and social skills are well developed through robotics education. It is an expressive way to involve children creatively for developing technical skills and curious mindset.
- Sharma, B. (2019) studied the effect of ICT on Teaching Learning process in professional courses. She has examined the use of ICT facilities by teachers and learners in Punjab University, Punjabi University & Guru Nanakdev University. It was found that ICT facilities are available in department of professional courses in these Universities however during study it came into light in comparison to teachers, ICT facilities in institutions were not easily available to students. The ICT facilities are always being used by teachers while teaching in classroom in Punjab University while teachers in Punjabi University and GNU do not use ICT facilities very often. The learners of Punjab University were satisfied the way ICT is being used in the

department while learners in other two Universities were not satisfied the way ICT is being used. Also, it was revealed that majority of students from Punjab University remain more confident and motivated in comparison to the other two universities learners. It has shown that professional education has been modernized with help of ICT. Teachers has confirmed that use of ICT in professional courses help in enhancement of skills like professional specific skill, personal skill, soft skill, organizational skill etc. ICT helps to generate teaching related enthusiasm in teachers, they further motivate learners to use ICT for learning, which in turn motivate learners to promote their problem-solving ability leading to better academic results.

- Vivekandhan, A. B. (2016) studied the Usefulness of E-learning in the Functional Literacy program for the Illiterates. He stated that flexibility and approachability of informative resource with convenience to individual learners as a special feature of ICT. State Resource Centre SRC and Tata consultancy services TCS has designed and developed computer based functional literacy. This will help the illiterates to develop reading skills in 120-150 hours. SRC & TCS has developed E-learning modules on adult literacy program. It has been shown in the study that usage of ICT has enriched the quality of livelihood among rural population. The ICT – education-Radio, TV and computer has played a vital role in the transformation of rural society. Adult education through ICT has attained its heights due to innovative effective retention and re-enforcement.
- Verma, R. & Kulshreshtha, A. K. (2017) has studied the Effect of constructivist Approach on Academic achievement, Lab competencies and Attitude of students towards Chemistry at Senior Secondary level. They have explored how teaching can be more effective by incorporating Constructivism into classroom. For this purpose, the researchers explain the constructive learning environment given by Jonassen 1999. The learning model based of 5Es i.e. Engage, Explore, Explain,Elaborate & Evaluate, of constructivist approach has been selected for Experimental teaching. The overall study results revealed

statistically significant improvement in academic advancement, laboratory competences and students' attitude towards chemistry as a result of constructivist approach in senior secondary class. It has helped in developing critical thinking & self- reliance among students.

- Shobha, K. M. (2016) investigated the Utilization and Effectiveness of EDUSAT programs on achievement in Environmental studies at Elementary level schools in Karnataka state. Major finding of study is that about 90% of school heads opined that EDUSAT programs are shown to students in schools, they have proper equipment's. They have separate room for EDUSAT programs (88%) Although more than 50% agree that they do not have good seating arrangement. But 97% of school heads agreed that their schools have better results after implementation of EDUSAT program in their schools. For effective implementation of this program, suggestion given by school heads (a) Teachers of elementary schools should be trained on how to facilitate the teaching learning process during transmission. (b) Proper schedule of program to be telecasted should be informed to teachers. (c) Time of transmission may be distributed class wise.
- Williams, D. T. (2020) North Carolina, In the study "A Formative Evaluation of STEM academy at Rural High School has investigated strategies for supporting the development and sustainability of a fledging STEM academy at Rural High School in North Carolina. The purpose of this qualitative study was to use formative program evaluation method for judging the impact of program, diagnosing potential problem in early stages and monitoring adaptation & adjustments through implementation of program. The finding of current study made clear the positive outcomes for students & teachers who teach them. It was revealed by the results that the probability of students to stay and gain the benefit of program is more, yet the recruiting and retaining quality teachers with prerequisite skill in rural teaching environment is a great challenge.
- Yiching Chem chi Cheng Chang (2018) researched entitled 'The Impact of an Integrated Robotic STEM course with sailboat on High

School students' perception'. The research has discussed task oriented teaching strategy. A experiment was conducted on 82 students of 10th grade, which were divided into experimental group and comparison group. One group worked with an integrated robotic STEM course, whereas comparison group worked with commercial robotics. After the semester the qualitative and quantitative analysis showed the experimental group which worked on integrated robotics have more positive result. Here Arduino robot was used where constructing a self-sailing robot challenge was given to participants.

- Abdelrahim el Mouhmand (2019) in his research paper on Educational Robotics suggested for introduction of educational robotics in school curriculum. Three reasons were explored for integrating educational robotics, they are 1) Educational robotics provide efficient learning strategy for students in fields of science, math, physics and Engineering STEM. 2) Educational robotics improves students' communication, collaboration and team work skills, 3) It creates fun and engaging environment for students. Therefore educational robotics should be crucial part of school education.
- Learning is the most important aspect in teaching process. Learning can be said as a modification of behavior through experience which happens in our day to day life. This modification of behavior through learning and experience helps the person to adjust to his surrounding in better way. Crow & Crow (1973) has defined Learning as the acquisition of habits, knowledge and attitude. Learning is permanent change in behavior as a result of experience, knowledge. It reflect constant change in behavior. It enables him to satisfy interests to attain goal [Aggarwal 2002].
- Learning is an inborn nature of human being. They are by nature curious, self-motivated, keen to learn new things and make efforts to adjust accordingly as stated by Woodworth (1945) .According to Mangal(2014) Learning is a process which develops a person either in good or bad way and makes him change behavior.

3. **SIGNIFICANCE OF THE STUDY**

For the growth and development of the nation in this scenario of growing competition, the professional are in the demand. To promote STEM education, ATAL Tinkering Labs are being established to encourage students in younger age to have hand on experience with technology. This in turn will create their interest to go for professional study in the field of STEM and also for development of innovative entrepreneurial skills. In addition to technical skill like creative thinking, problem solving, communicating skills etc, STEM education also help in enhancement of social emotional learning of students.

This study will tell about how STEM education is helpful in improving social emotional learning of students, that is being imparted through ATLs, whether they are properly functional in school. There is comparative study of Social Emotional learning of Students who are enrolled in STEM education and other Students of school. How these labs are helpful in enhancement of social emotional skills where students work in team, so team spirit is developed. They are getting practical experience and self-learning is taking place, which would make students more responsible and a decision maker. The study will also tell if there is some lack in proper functioning of ATLs that can be improved by intervention of Government.

Setting of Atal Tinkering Labs is an ambitious project of Government in which hard earned money of tax payers is being used. This study will help to ensure proper utilization of Government money and resources. A strategic approach may be designed to facilitate learning of students, if so required. ATLs must meet the needs of students, so that desired results can be achieved.

4. STATEMENT OF PROBLEM

"To Assess Social Emotional Learning of Student Enrolled in STEM Education"

5. OPERATIONAL DEFINITIONS

5.1 STEM Education

STEM is abbreviation for Science, Technology, Engineering and Mathematics. Instead of teaching the four subjects separately, through STEM education all these subjects are incorporated. It is application based study of science, mathematics engineering and use of technology in day to day life. Atal Tinkering Labs of size about 1200-1500 square feet. Is the place where students can work on latest technologies like 3D printers, Robotics with internet connection are available. In the context of present study, STEM education will be considered as the education provided through ATLs.

5.2 Social Emotional Learning

Learning is commonly defined as a relatively permanent change in behavior that occur as result of experience. Social learning is regarding society, seeking or enjoying the companionship of others

Emotional learning is connected with people's feeling and showing them. Therefore, social and emotional learning is acquiring understanding, knowledge, skills, behavior, value, attitude and preferences regarding above mentioned social and emotional aspects of life. For the purpose of present study, a psychological test will be developed by the researcher on the basis of defined aspects of social and emotional learning

6.1 OBJECTIVE OF STUDY

1 To Assess the awareness of STEM Educators about Social Emotional Learning

2 To Study and compare Social Emotional Learning of students enrolled in STEM Education and other students of school.

3 To Study and compare Social Emotional learning of students enrolled in STEM Education in urban schools and in rural schools.

4 To Study and compare social and emotional learning of students enrolled in STEM Education in Government schools and Private schools.

5 To Review curriculum offered under STEM Education in light of Social Emotional Learning.

6 To Suggest capacity building of STEM Educator on Social Emotional Learning of students.

6.2 HYPOTHESES

Following null Hypotheses have been framed by the researcher for the convenience of statistical analysis.

1. There exists no significant difference in Social Emotional Learning of students enrolled in STEM Education and other students of school.
2. There exists no significant difference in Social Emotional learning of students enrolled in STEM Education in urban schools and in rural schools
3. There exists no significant difference in social and emotional learning of students enrolled in STEM Education in Government and private school.
4. There exist no significant difference in awareness about Social Emotional Learning of STEM educator and other teachers of school.

7 METHODOLOGY

Research is the creation of new knowledge and/ or use of existing knowledge in a new and creative way to generate new concepts. Research is careful consideration of study regarding a particular problem using scientific methods. Research is an art of scientific investigation. It is an honest attempt to examine, observe and analyze a problem or a phenomenon. George J. Mouly has defined research as a systematic and scholarly application of scientific method. According to John W Best, "Research is a formal, systematic, intensive process and scientific method for analyzing". There is a systematic structure of investigation in research which usually involves in some formal record of procedure and a report of result of conclusions (Pathak R.P 2011). On the Basis of above discussion and various definitions, it can be said that research has following characteristics.

1. It has clearly defined parameters.
2. It is systematic, empirical and critical inquiry.
3. IT involves honest and in-depth process.
4. It describes and explains the problem.
5. Its findings are valid and verifiable.

7.1 Research Method

The present research will be intended to assess social emotional learning of students enrolled under STEM Education. Therefore, descriptive method of research will be employed for the present study as it is concerned with interviewing, surveying, describing and investing the existing phenomenon or issues, conditions and relationships that exist

7.2 Sampling Method

Multi Stage Sampling will be used in the proposed study. At the first Stage of sampling, researcher purposively will select five schools from Haryana State where Atal tinkering Labs are available and functioning. The five schools which researcher has identified are 1)

Government Model Senior Secondary School Sanghi, Rohtak;2) Aarohi Model School Bapoli, Panipat; 3) B.L.G.S.S.S. Khol Rewari and two private school in Gurgaon district.

At stage-II, in the light of objectives of proposed study, again researcher will chose the purposive method of sampling by distributing the students in two groups out of which one group is being taught in ATLs and other one is in default settings of school.

At third stage, researcher randomly will select a total of 30 students in each of five schools, who are using Atal Tinkering Labs and 30 students in each school who are not using Atal Tinkering Labs.

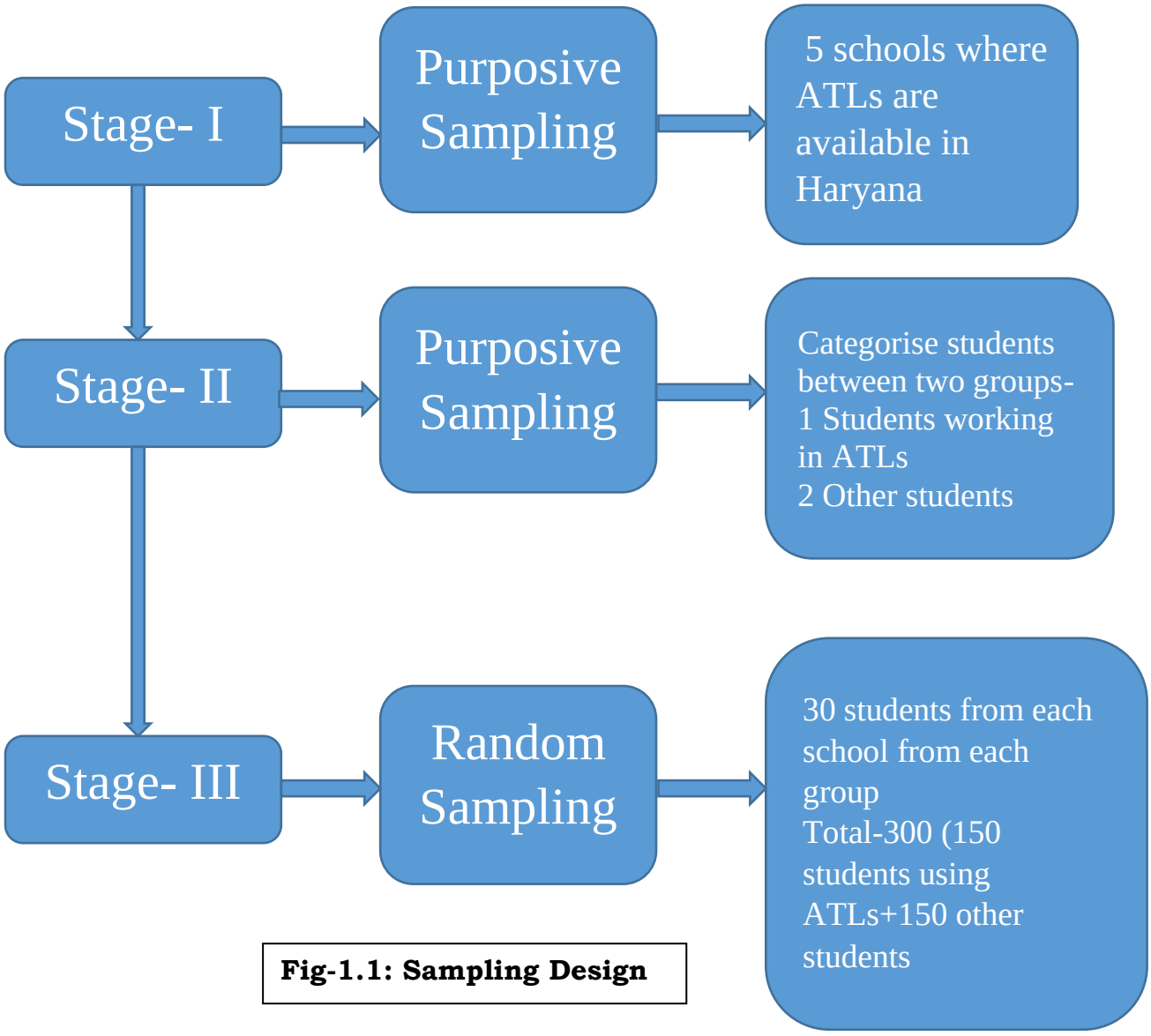
Stage- I
Purposive Sampling
5 schools where ATLs are available in Haryana
Stage- II
Purposive Sampling
Categorise students between two groups-
1 Students working in ATLs
2 Other students
Stage- III
Random Sampling
30 students from each school from each group
Total-300 (150 students using ATLs+150 other students

Fig-1.1: Sampling Design

Thus, a total of 300 students will be the cumulative sample of the study out of which 150 students will be using ATLs and 150 students will be those who are not using ATLs. All the three stages are summarised in Fig-1.1.

7.3 Variables of the study

The present study will consist of three types of variables:

- **Independent Variable**- STEM Education (Education provided through Atal Tinkering Lab)
- **Dependent Variable**- Social and Emotional Learning
- **Extraneous Variables**- Financial Status of Students, Education of Parents, students' intelligence Quotient etc.

7.4 Tools to be used

7.4.1 Observation

As per the requirement of the proposed study STEM Education is to be provided which is being provided through ATLs in Haryana State. At first, researcher will observe some of the session or classes of those students who are studying in ATLs to make sure that STEM education is provided in expected way.

7.4.2 Interviewing

A comprehensive interview with STEM educators of selected schools will be conducted by researcher to assess their awareness about Social emotional learning.

7.4.3 Focus Group Discussion

Researcher will undergo detailed discussion with students enrolled in STEM Education as well as other students of school to know about their social emotional competencies

7.4.4 Social and Emotional Learning

To measure social and emotional learning of students, surveying of students will be done by researcher using a self developed tool as per the requirements of the study.

7.5 Procedure of Data Collection

First, Researcher will take the permission from the concerned authority of selected school for data collection. After receiving permission for data collection, as mention in the section one of tools to be used, the researcher will observe the working pattern of ATLs in the light of STEM education. After ensuring the implementation of STEM Education in ATLs, researcher will interview STEM Educator to assess their awareness about SEL, and then administer the social and emotional learning tool to collect the required data from the students. For administration, researcher first will make a rapport among students of both the groups in school. Then researcher will distribute the test among the students and will explain the procedure of filling the same. After completion of the test researcher will collect them back from the students. To know more about students perspective on SEL, some students will be involved in FGD.At the end researcher will show her gratitude towards the students, school staff and the head for their cooperation. The same procedure will be followed in each school.

7.6 Statistical Technique

For the purpose of statistical analysis of data, following statistical techniques will be employed:

(i) Descriptive Statistics: Mean , SD

(ii) Inferential Statistics: t-Test

All these analyses will be conducted through SPSS 16.0. SPSS is modular, tightly integrated, full featured statistical software for elementary and advanced statistics. SPSS datasets have a two-dimensional table structure where the rows typically represent cases (such as individuals) and columns represent measurements (such as variables). Only 2 data types can be defined i.e. numeric and string (text). A sequential processing (case-by-case) is occurred through the file on data.

DELIMITATIONS

The study will be delimited to:

1. Haryana state only.
2. Only 150 students studying in ATLs
3. Only of 150 students studying in default setting of schools

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